VALUE ENGINEERING STUDY
OF
EDS-545(44) (SR 4/US 1)
PI NUMBER: 222490

ATLANTA, GEORGIA
MARCH 5, 2004

Prepared by:
Ventry Engineering, L.L.C.

In Association With:

Georgia Department of Transportation

VALUE ENGINEERING STUDY
TEAM LEADER

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Date: _____

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I. INTRODUCTION

GENERAL

This Value Engineering report summarizes the results of the Value Engineering study performed by Ventry Engineering for the Georgia Department of Transportation. The study was performed during the week of March 5, 2004.

VALUE ENGINEERING METHODOLOGY

The Value Engineering Team followed the basic Value Engineering procedure for conducting this type of analysis.

This process included the following phases:

1. Investigation
2. Speculation
3. Evaluation/Development
4. Report Preparation

Evaluation criteria identified as a basis for the comparison of alternatives included the following:

- Construction Cost
- Maintenance Cost
- Constructability
- Ease of Construction
- Construction time
- Impact to Traffic

SUMMARY OF RECOMMENDATIONS

It is the recommendation of the Value Engineering Team that the following Value Engineering Alternatives be carried into the Project Development process for the final plans and specifications.

RECOMMENDATION NUMBER 1- CONSTRUCTABILITY

The Value Engineering Team recommends that Value Engineering Alternative Number 1 be implemented. This alternative clarifies the construction of the cross drainpipe and pond restoration at station 195 and what has been negotiated with the landowner.

RECOMMENDATION NUMBER 2- CONSTRUCTABILITY

The Value Engineering Team recommends that Value Engineering Alternative Number 2 be implemented. This alternative changes the staging of all the box culverts, extends the existing box culverts or provides a runaround at the box culvert locations.

If this recommendation can be implemented, there is a possible **$79,545.**

RECOMMENDATION NUMBER 3- CONSTRUCTABILITY

The Value Engineering Team recommends that Value Engineering Alternative Number 3 be implemented. This alternative eliminates the pipe collars, if possible.

RECOMMENDATION NUMBER 4 - STAGE CONSTRUCTION

The Value Engineering Team recommends that Value Engineering Alternative Number 1 be implemented. This alternative includes stage construction cross sections in the plans.

RECOMMENDATION NUMBER 5 - STAGE CONSTRUCTION

The Value Engineering Team recommends that Value Engineering Alternative Number 2 be implemented. This alternative reworks the temporary roadway at station 15-20 on current Stage 1A to include a ditch.

RECOMMENDATION NUMBER 6 - STAGE CONSTRUCTION

The Value Engineering Team recommends that Value Engineering Alternative Number 3 be implemented. This alternative changes the staging plans to have sequential staging numbers.

RECOMMENDATION NUMBER 7 - STAGE CONSTRUCTION

The Value Engineering Team recommends that Value Engineering Alternative Number 4 be implemented. This alternative would insure that there is adequate earthwork available for each stage where it is needed.

RECOMMENDATION NUMBER 8 - CONSTRUCTION TIME

The Value Engineering Team recommends that the Value Engineering Alternative be implemented. This alternative changes the construction time form 18-24 months to 30 months.

RECOMMENDATION NUMBER 9-OTHER

The Value Engineering Team also recommends that these Other Value Engineering Alternatives be implemented:

1. A detail is needed to properly construct nose points of Type "B" median crossovers – especially when the mainline is in a horizontal curve. The drainage and the difference in elevation between the roadways presents unique problems for this situation.
2. A chart needs to be included describing the allowable materials for drainage structures on this project.
3. Construction Standard 9017R needs to be used for both the new and the existing bridge.
4. Required slope drains along asphalt curb runs behind guardrail needs to require an additional three feet of shoulder for proper construction.
5. The mainline Typical Sections should use full depth base and paving for the shoulders.

6. The Swainsboro Bypass has split roadway profiles on its southern end. This project as proposed does not. With the completion of the Bypass anticipated within the next few months, the profiles for this project need to be revised to match what will be in place.
7. The pay item for precast concrete median barriers needs to be changed from Method 1 to Method 3.
8. Include both details for pavement widening fabric.
9. Safety end sections should be 6:1 rather than 4:1.
10. An item is needed for temporary fence to be used in SR 57 staging
11. Intersection signing should be placed approximately four seconds of travel time from the beginning of the turn lanes. This would allow two seconds for reaction time and two seconds to change lanes before turn lane.

II. LOCATION OF PROJECT

MAP

III. TEAM MEMBERS AND PROJECT DESCRIPTION

TEAM MEMBERS

NAME	AFFILIATION	EXPERTISE	PHONE
William F. Ventry	Ventry Engineering	Team Leader	850/627-3900
Bruce Nicholson	Ventry Engineering	Construction	850-627-3900
Richard Marshall	GADOT	GO Construction	404-656-5306
Lisa Myers	GA DOT	Engineering Services	404-651-7468
Jimmy Smith	GADOT	District Construction	478-553-2331
Barry Wood	GADOT	District Construction	478-289-2614
Steve Gaston	GADOT	Bridge Design	404-656-5197
Scott Zehngraff	GADOT	Traffic and Safety	404-635-8127

PROJECT DESCRIPTION

This project consists of the widening and reconstruction of SR 4/US 1 from the intersection of SR 46 with SR 4/US 1 just north of I-16 to the southern terminus of the West Swainsboro Bypass at SR 297, for a gross length of 9.95 miles. A new bridge will be constructed for the northbound lanes over Jack's Creek. The existing bridge over Jack's Creek will be raised and widened for the southbound lanes.

IV. INVESTIGATION PHASE

EDS-545(44) (SR 4/US 1)
VALUE ENGINEERING STUDY BRIEFING
MARCH 5, 2004

NAME	AFFILIATION	PHONE
William F. Ventry, P.E., C.V.S.	Ventry Engineering	850/627-3900
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INVESTIGATION

The following areas have been identified by the Value Engineering Team as areas of focus and investigation for the Value Engineering process:

A. CONSTRUCTABILITY

B. STAGE CONSTRUCTION

C. CONSTRUCTION TIME

V. SPECULATION PHASE

SPECULATION

Ideas generated, utilizing the brainstorming method, for performing the functions of previously identified areas of focus.

A. Constructability

- Clarify the construction of the cross drain pipe and pond restoration at Station 195 and what has been negotiated with the landowner
- Change the staging of all the box culverts, extend the existing box culverts or provide a runaround at the box culvert locations
- Eliminate pipe collars, if possible

B. Stage Construction

- Include stage construction cross sections in the plans
- Rework the temporary roadway at station 15-20 on current Stage 1A
- Change the staging plans to have sequential staging numbers
- Insure that there is adequate earthwork available for each stage where it is needed

C. Construction Time

- Change the construction time form 18-24 months to 30 months

VI. EVALUATION/DEVELOPMENT PHASE

VI.(A) ALTERNATIVES

ALTERNATIVES

The following alternatives were formulated during the "eliminate and combine" portion of the Evaluation Phase.

A. CONSTRUCTABILITY

Value Engineering Alternative Number 1 - Clarify the construction of the cross drain pipe and pond restoration at station 195 and what has been negotiated with the land owner.

Value Engineering Alternative Number 2 - Change the staging of all the box culverts, extend the existing box culverts or provide a runaround at the box culvert locations.

Value Engineering Alternative Number 3 - Eliminate pipe collars, if possible.

B. STAGE CONSTRUCTION

Value Engineering Alternative Number 1 - Include stage construction cross sections in the plans.

Value Engineering Alternative Number 2 - Rework the temporary roadway at station 15-20 on current Stage 1A to include a ditch.

Value Engineering Alternative Number 3 - Change the staging plans to have sequential staging numbers.

Value Engineering Alternative Number 4- Insure that there is adequate earthwork available for each stage where it is needed.

C. CONSTRUCTION TIME

Value Engineering Alternative- Change the construction time form 18-24 months to 30 months.

VI.(B) ADVANTAGES AND DISADVANTAGES

EVALUATION/DEVELOPMENT

The following Advantages and Disadvantages as well as other pertinent information was developed for the Value Engineering Alternatives previously generated during the speculation phase.

A. CONSTRUCTABILITY

1. Pond Restoration

Value Engineering Alternative Number 1

At approximate Sta 195, a new 36" RCP is proposed to be installed on a 50 degree skew. The outlet end of the proposed pipe extends into an existing pond. This pond has been identified as requiring lake restoration and a pay item has been included for this work to be performed.

In reviewing the staging plans and drainage profiles, it was determined that there was nothing to address the problem of the 36" pipe extending into the pond. The outlet flow line for the pipe is 209.10 and the elevation of the pond water is 209.91. This means that the outlet will be under the normal pool elevation of the pond. It is recommended that additional detail be included in the staging to address this. The pond elevation should be lowered to allow for the pipe construction. Further, an item for rock embankment should be added to stabilize this area prior to the pipe installation. The Georgia Department of Transportation should review the right-of-way negotiations to determine any property owner concerns in the resolution of this construction problem.

Value Engineering Alternative Number 1 - Clarify the construction of the cross drainpipe and pond restoration at station 195 and also determine what has been negotiated with the landowner.

Advantages

- Would clarify staging of the pond restoration
- Would complete work on pond before constructing pipe
- Could avoid a claim

Disadvantages

- None apparent

Conclusion

Carry forward for further evaluation

A. CONSTRUCTABILITY

2. Culvert Construction

Value Engineering Alternative Number 2

There are seven concrete box culverts proposed for this project. Each is an entirely new structure located near an existing structure. There are unique problems with each culvert so therefore a discussion of each with the study team's recommendation follows:

A) Sta 134+69 Construct a new 4'X4' concrete box culvert to replace the existing 4'X3' structure. The staging describes the new culvert be built under traffic and there is a height of fill of over 16 feet. This cannot be built in this manner. It is recommended that the staging be changed to construct approximately half of this structure under the future northbound travel lanes. The culvert should be as close as possible to the existing flow line to lessen any zigzagging of the water between new and old culverts. Additional concrete median barrier and appurtenances will also need to be added. After the traffic has been shifted to the new lanes, the existing culvert can be removed and the new culvert can be completed.

B) Sta 178+10 Construct a new 4'X4' concrete box culvert to replace the existing 4'X3' structure. The staging again describes that the new structure will be built under traffic and again this cannot be accomplished. It is the recommendation of the study team that the existing culvert be extended rather than replaced. The downstream portion of the culvert from approximately the center of the median can be constructed on a skew from near the existing outlet to the proposed outlet. This extension can be 4'X4'. At the centerline of the median a new median drop inlet can be added. Between this new drop inlet and the existing structure and from the existing structure to the new inlet end the extension would have to be 4'X3'. Structure 33-M can probably be eliminated. By extending the existing structure, the construction time and cost will be reduced. A cost comparison of this recommendation is included in this study.

C) Sta 208+86 Construct a new 6'X4' concrete box culvert to replace the existing culvert. The staging again describes that the new structure will be built under traffic and this cannot be done. This location is even worse than a) and b) above due to the fill height being approximately 25 feet. It is the recommendation of the study team that the staging for this location be revised as follows: 1) construct approximately half of the culvert and half of the embankment, right of centerline; 2) construct temporary pavement and detour traffic onto this first stage; 3) remove the existing culvert and construct the remaining portion of the new culvert to the left of centerline; 4) place new embankment and paving on this upstream side; 5) shift traffic to this just completed stage; 6) finish embanking of the right side and construct base and pavement.

D) Sta 227+30 Construct a new 6'X4' concrete box culvert to replace the existing culvert. The study team recommends that this construction be completed as described for the culvert at Sta 208+86.

{Since the traffic must be shifted in the same direction for both of the above culverts, the staging should lump the two detours into one. Also, the study team suggested that some review should be made to perhaps change the profile in this section to enable the existing structures to be retained and extended. This would save a significant amount of construction time. Additionally, by lowering the profile, the amount of borrow excavation needed for this project would be reduced}

E) Sta 304+91 Construct a new 5'X4' concrete box culvert to replace the existing 5'X4'. The staging for this location is similar as that described above and must be changed. It is recommended for this location that a slight modification in the profile be made to allow the use of the existing structure. This structure can then be extended rather than replaced. The cost savings is included on the attached cost comparison sheet.

F) Sta 320+64 Construct a new 5'X4' concrete box culvert to replace the existing 5'X4'. It is recommended that this location be the same as e) above.

G) Sta 512+01 Construct a new 5'X4' concrete box culvert to replace the existing 5'X4'. It is recommended that this location be the same as e) and f) above. This location is even more critical due to the close proximity of the proposed and the existing culverts.

Value Engineering Alternative Number 2 - Change the staging of all the box culverts, extend the existing box culverts or provide a runaround at the box culvert locations.

Advantages

- Easier construction
- Less conflict with existing box culverts
- Less traffic control impacts
- Avoids possible claim for extra work

Disadvantages

- None apparent

Conclusion

Carry forward for further evaluation

Insert 1

Insert 2

Insert 3

Insert 4

Insert 5

Insert 6

Insert 7

Insert 8

VALUE ENGINEERING ALTERNATIVE NUMBER 2
CONSTRUCTABILITY CULVERT EXTENSIONS
COST COMPARISON SHEET

DESCRIPTION	UNITS	UNIT COST	PROP'D QTY.	PROP'D COST	V.E. QTY.	V.E. COST
4'X4' BOX CULVERT @ STA 134+69	CY	$290.00	96.0	$27,840	75.0	$21,750
REMOVE EXISTING CONCRETE BOX CULVERT AT STA 134+69	LF	$135.00	60.0	$8,100	0.0	$0
PIPE STRUCTURE 33-M	LF	$26.00	90.0	$2,340	0.0	$0
FES STRUCTURE 33-M	EA	$435.00	1.0	$435	0.0	
5'X4' BOX CULVERT @ STA 304+91	CY	$290.00	102.0	$29,580	60.0	$17,400
PIPE STRUCTURE 56-M & 58-M	LF	$26.00	190.0	$4,940	0.0	$0
FES STRUCTURE 56-M & 58-M	EA	$435.00	2.0	$870	0.0	$0
5'X4' BOX CULVERT @ STA 320+64	CY	$290.00	115.0	$33,350	67.0	$19,430
PIPE STRUCTURE 62-M	LF	$26.00	80.0	$2,080	0.0	$0
FES STRUCTURE 62-M	EA	$435.00	1.0	$435	0.0	$0
5'X4' BOX CULVERT @ STA 520+01	CY	$290.00	104.0	$30,160	49.0	$14,210
SUBTOTAL				**$140,130**		**$72,790**
OTHER ITEMS AND CONTINGENCIES			12.5%	$17,516	12.5%	$9,099
SUBTOTAL				**$157,646**		**$81,889**
INFLATION			5.0%	$7,882	5.0%	$4,094
GRAND TOTAL				**$165,529**		**$85,983**

POSSIBLE SAVINGS
$79,545

A. CONSTRUCTABILITY

3. Slope Drain Collars

Value Engineering Alternative Number 3

Several slope drains are proposed for construction in this project as the outlet for median drains. The pipe collar poured at the junction of the median drain and the slope drain is prone to failure and results in the blow-out of the fill section. It is the recommendation of the study team that wherever possible that this proposed construction be changed by using one of the following choices:

a) make the median box deeper so that the need for a slope drain is eliminated;
b) have a straight flow line from the median box to the required outlet flow line elevation;
c) combination of a) and b).

Value Engineering Alternative Number 3 - Eliminate pipe collars, if possible.

Advantages

- Avoids future maintenance
- Easier construction
- May be less construction cost

Disadvantages

- None apparent

Conclusion

Carry forward for further evaluation

B. STAGE CONSTRUCTION

1. Stage Construction Cross Sections

Value Engineering Alternative Number 1

The project plans have several stages proposed. There is a difference in grade proposed throughout much of the project. It is recommended that cross sections be provided for each of the various stages to make the project more manageable. It will also better reveal any problems with the difference in elevations between travel lanes and in traffic shifts.

It is also recommended that a profile be provided for each of the various stages to ensure constructability.

Value Engineering Alternative Number1 - Include stage construction cross sections in the plans.

Advantages

- Easier to understand staging
- Less confusion for contractor
- Avoids fill problems during construction
- Avoids pavement problems during construction

Disadvantages

- None apparent

Conclusion

Carry forward for further evaluation

2. Stage 1-A

Value Engineering Alternative Number 2

This staging is for the relocation of SR 57. The proposed work includes the construction of some temporary paving from +/- Sta 15 to +/- Sta 20. The typical section for this work implies that a ditch is not to be constructed on the right side. The typical section is oriented incorrectly. An on-site field inspection revealed that the terrain in this area drained toward the roadway. It is therefore recommended that the typical section be corrected and that a shallow ditch be added to facilitate drainage.

Value Engineering Alternative Number 2 - Rework the temporary roadway at station 15-20 on current Stage 1A to include a ditch

Advantages

- Avoids water and debris on roadway
- Less maintenance during construction
- May avoid closing roadway

Disadvantages

- Impact to adjacent property owner

Conclusion

Carry forward for further evaluation

B. STAGE CONSTRUCTION

3. Stage Numbering

Value Engineering Alternative Number 3

The project plans have several stages proposed. Included in these are Stage 1-A and 2-B, etc. This is not typical stage designations as commonly used in roadway construction plans. It is recommended that the staging be numerically numbered in the required order of their construction.

Value Engineering Alternative Number 3 - Change the staging plans to have sequential staging numbers.

Advantages

- Less confusing to contractor and GDOT personnel
- Contractor would know exactly which stage was to be accomplished next

Disadvantages

- None apparent

Conclusion

Carry forward for further evaluation

4. Staging Earthwork

Value Engineering Alternative Number 4

The project has almost 1,000,000 cubic yards of either unclassified excavation or borrow set up. The staging plans do not include a break down of how much earthwork is involved in each stage. It is recommended that the earthwork quantities be provided for each stage to ensure that there is a sufficient material available to construct each stage.

Value Engineering Alternative Number 4 - Insure that there is adequate earthwork available for each stage where it is needed.

Advantages

- Avoids overrun on the borrow item
- May avoid having both more borrow and excavation to waste
- Contractor would know how to bid

Disadvantages

- None apparent

Conclusion

Carry forward for further evaluation

C. CONSTRUCTION TIME

Project EDS-545(44) has 24 months as the required amount of time to construct the new roadway. Much discussion from the study team resulted in the decision that this was probably insufficient. It is recommended that the time allotted to construct this project be increased from the 24 months as proposed to 30 months.

Value Engineering Alternative- Change the construction time form 18-24 months to 30 months.

Advantages

- Allows more adequate time to complete
- May make traffic control easier
- Staging may be easier

Disadvantages

- Longer disruption to local traffic and businesses

Conclusion

Carry forward for further evaluation